2017 | 005

INSPIRE

RESEARCH AUSTRALIA SHOWCASES HEALTH & MEDICAL RESEARCH

3D BIOPRINTING TECHNOLOGIES:
Unlocking new treatments for type-one diabetics

KNOCKOUT
A one-two punch against pancreatic cancer

PLUS:

Avatar transforms dementia care training

Researchers and the Health Data Maze

SHEDDING LIGHT:
Genome Sequencing & Mitochondrial Disease

RESEARCH AUSTRALIA

CONNECTING · ENGAGING · INFLUENCING

Message from CEO

On the cover of the fifth edition of INSPIRE is the incredible imagery from Queensland Brain Institute at the University of Queensland. Thank you to Adekunle Bademosi for his Interconnectivity - dance of SNAREs in the dark photo. 2017 is indeed proving a big year for our sector with the numerous reviews and consultations absorbing much energy, but importantly ensuring multiple views are canvassed and incorporated in some of the changes we are now seeing. This includes the highly-anticipated changes to the NHMRC's grant funding program. These recently announced reforms do meet the key objectives of reducing the burden on applicants and peer reviewers, and improve opportunities for early and mid-career researchers. And, as NHMRC CEO Anne Kelso acknowledges, free up valuable time for vital research as well as promote collaboration opportunities.

Also notable for our sector, is the Government's commitment to the Medical Research Future Fund and the disbursements with $65.9M worth of programmes and initiatives announced in the May budget.While there is no magic potion to cover everything, few could argue that these are not strong developments and promote a vibrant time for health and medical research in Australia.

While we continue to highlight the importance of grants, funding and fellowships it is only fitting to mention the MS Research article, *Make research investments count; Inspiring the investment community to support health and medical research in Australia* on page 34. The fundraising channel used to grow awareness and research funding is one to be noted.

It would be remiss of me not to highlight the inspiring advances being made in post-stroke language recovery, genome sequencing to shed light on a disease without cure and discovery toward cost effective and non-invasive Alzheimer's treatments – a significant step given dementia is the second leading cause of death in Australia. None of this work would be possible without inspired and brilliant minds, which is why, our valued member CSL is seeking Australia's best and brightest Biomedical Researchers. Celebrating 100 years, the CSL Centenary Fellowships established a flagship $25 million fellowship program for discovery and translational research. Head to page 14 to put your hat in the ring for this innovative fellowship.

I trust you will enjoy the stories of inspiration in this edition as well as capitalise on the opportunities 2017 is bringing our health and medical research sector.

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Who can submit articles?
Any current member of Research Australia who would like to share a relevant story that affects their organisation including, philanthropic donations and their outcomes, research findings, and any other related health and medical research topic that affects the Australian population.

Submission guidelines & deadlines
For information regarding how to submit and publishing deadlines visit the Research Australia website.

RESEARCH AUSTRALIA
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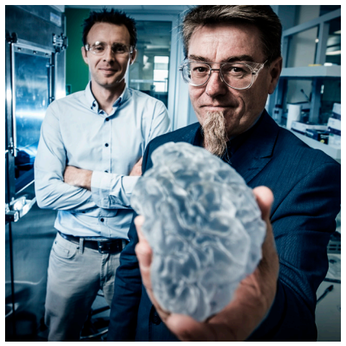
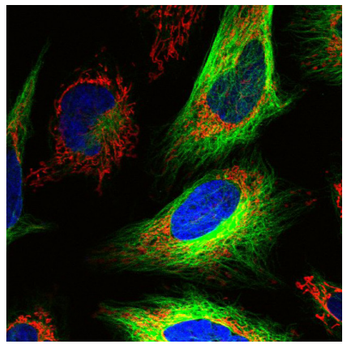
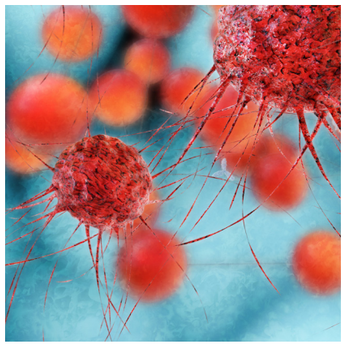






AUSTRALIAN HEALTH & MEDICAL RESEARCH

>> Cover Image: ***Interconnectivity***
Adekunle Bademosi / Queensland Brain Institute at The University of Queensland

@ARC_ACES @GordonGWallace
#diabetes #3Dimaging

3D BIOPRINTING TECHNOLOGIES

UNLOCKING NEW TREATMENTS FOR TYPE-ONE DIABETICS

THE CHALLENGE

You know you've hit the big time when you've made the cover of Time Magazine, US. *'Diabetes: Are you at Risk?'*

That was the headline more than a decade ago, and since then, both types of diabetes have been on the rise. Type one diabetics the world over is kept alive each day by the twentieth century wonder-drug insulin, but still they face some grim long-term statistics. On average, it shortens the patient's life by a staggering 15 years.

Those with juvenile onset are 25 times more likely to develop renal failure, 20 times more likely to go blind, 40 times more likely to lose a limb and five times more likely to have a heart attack.

Some diabetics suffer from *'hypoglycemic unawareness'*, a condition that renders them unable to sense an oncoming low blood sugar event—and while it's rare, the outcome can be catastrophic if it happens while driving, holding a baby in the bath or crossing the street.

It's these statistics and severe complications that drive the Royal Adelaide Hospital's transplant specialist Professor Toby Coates to push the boundaries when it comes to treating and potentially curing type-one diabetes.

WHY NOT REPLACE THE MISSING CELLS?

Toby sees a lot of patients with the severe complication, *hypoglycemic unawareness*.

"It's for these patients that we've developed the treatment of replacing islet cells. We know that the only cells in the body capable of producing insulin are found in islet cells—so the obvious question to me as a doctor is, why don't we give them more?" he said.

This surgical concept has been around for some time, with the first whole pancreas transplant taking place in 1967 and the first donor islet cell transplant taking place in 1990. Transplant surgery as an option didn't take off until the advent of immune-suppressing drugs in 2000.

Toby says there's still room for improvement.

"One in 50 whole pancreas transplant patients won't survive, and those that do face a lifetime of taking immune suppressing drugs which can have unpleasant side effects. For these reasons, transplant surgery is reserved for the very sickest of type one diabetics," he said.

"What I'd like to see is a simplified treatment—why not grow the islet cells from the patient's own stem cells to wipe out the need for ongoing medication? What else can we do to protect the cells? Do we even need to put patients through a major surgery?"

3D PRINTING ISLET CELLS IN SPECIAL INKS TO ENHANCE TAKE UP RATES

Toby started kicking these questions around with biofabrication expert and Director of the ARC Centre of Excellence for Electromaterials Science (ACES), Australian Laureate Professor Gordon Wallace, two years ago, with promising initial results.

> ***Our multidisciplinary team of experts has custom built a 3D bioprinter which can print donor islet cells for transplant," Professor Wallace said.***

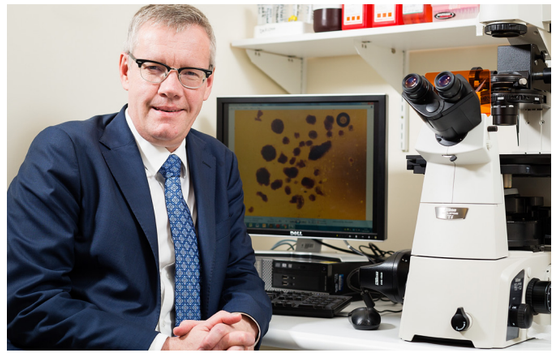
In addition to building the printing hardware, they have made an ink containing donor islet cells as well as nanoparticles which house immuno-suppressant drugs.

"This is an exciting development as it shows we can put all the required cells next to each other in the right order, and combine it with factors to improve the immune system's response," Toby said. "In the first instance, this may be a more effective way to use donor islet cells."

"If we can come up with ways to enhance the effectiveness of the treatment, especially using the patient's own cells, it could be a cure for all patients with type-one diabetes," he said.

Gordon said this type of project is a priority for his team and partner, the Australian National Fabrication Facility (ANFF), as it is accelerating bench to bedside research.

"The end game here is for the ACES-ANFF partnership to deliver printing hardware and protocols into Toby's lab so that a clinical outcome can be fast tracked," he said.



>> Pictured above **Professor Toby Coates, Image credit Andrew Beveridge, asbCreative**
>> Pictured top **Intelligent Polymer Research Institute**

Authors: Sarah McMaster and **Natalie Foxon,** ARC Centre of Excellence for Electromaterials Science | Innovation Campus

A ONE-TWO

PUNCH FOR PANCREATIC CANCER

Exploring the tissue that surrounds pancreatic tumours

@GarvanInstitute
#pancreaticcancer #hmr

Pancreatic cancer is a killer. Currently, five-year survival rates after diagnosis stand at just 7%, a figure that has barely changed in the last 40 years. Even the standard-of-care for inoperable pancreatic cancer – a combination chemotherapy approach – is only moderately effective in extending survival, so research into possible new therapies is urgently needed.

Now, scientists from Sydney's Garvan Institute of Medical Research have uncovered a promising new approach to treating pancreatic cancer, by targeting the tissue around the tumour to make it 'softer' and more responsive to chemotherapy.

Pancreatic tumours, like all solid tumours, exist within a complex 'nest' of surrounding cells, blood vessels and other structures, known as the stroma. It is known that interactions between the stroma and cancer cells are important for tumour survival and progression.

WHAT THE NEW STUDY REVEALED

In the new study[1], researchers 'primed' pancreatic tumours by treating mice with *Fasudil* – a drug that 'slackens the ropes' of the stroma to make tumours softer, and also makes the blood vessels around tumours 'leaky'. After a three-day priming treatment, they then treated with standard-of-care chemotherapy for pancreatic cancer.

Remarkably, this sequential approach of priming before chemotherapy doubled survival time in mice, and also impaired the spread of cancer to other tissues. The findings hint that a two-step approach – a one-two punch – could form the basis of more effective pancreatic cancer treatments.

For Dr Paul Timpson and Dr Marina Pajic (Cancer Division, Garvan), who together led the research, the results represent a major step forward towards new and better therapies.

"Pancreatic cancer researchers around the world are inspired by an international goal to double pancreatic cancer survival by 2020[2] – so it's particularly exciting that we have been able to achieve this in preclinical models," Dr Timpson says.

To fine-tune their sequential approach, the researchers used cutting-edge intravital microscopy techniques to peer directly into pancreatic tumours inside a living animal, and to watch, in real time and in three dimensions, how priming with fasudil altered the tumour and its surrounding stroma. They also watched how blood vessels surrounding the tumour were affected.

Dr Pajic says, "We saw the stroma weaken over time, and could also see that cancer cells did not spread so readily to secondary sites such as the liver.

"We also looked over time at the blood vessels supplying the tumour, using fluorescent quantum dots in the bloodstream. It was remarkable to watch the quantum dots radiate out from blood vessels adjacent to the tumours after *Fasudil* treatment – which is an indicator that the vessels have become leaky."

WHAT WORKS BEST FOR TUMOURS

Importantly, the research team also showed that some pancreatic tumours respond more favourably than others to the sequential 'priming therapy'. Using patient tumour samples from the Australian Pancreatic Cancer Genome Initiative, the team developed an automated analysis of tumour tissue to predict an individual tumour's response to the sequential treatment.

Dr Timpson says, "What we're seeing is that the therapy works best for tumours with large amounts of surrounding stroma, and tumours with a high density of surrounding blood vessels."

For Drs Timpson and Pajic, the most exciting aspect of the research is its clinical potential.

"*Fasudil* is already in clinical use as a treatment for stroke in Japan and is off-patent – so there is strong potential to repurpose it for the treatment of pancreatic cancer," Dr Pajic points out.

"Moreover, in the clinic, *Fasudil* is administered over a short 3-day period, just as we have done in our study, and there is extensive safety data to validate this approach.

"We'd like to see *Fasudil* or other therapies translate into precision medicine approaches for pancreatic cancer in the future – so that individuals receive the therapies that are most appropriately matched based on the biology of their individual tumour."

By working closely with expert clinician-scientists within The Kinghorn Cancer Centre (Sydney), a joint facility of Garvan and St Vincent's Hospital and an established Phase I trials unit, the research team now aims to translate these findings into an early-stage clinical study to examine the safety of this new 'priming' approach.

[1]Vennin et al (2017). Transient tissue priming via ROCK inhibition uncouples pancreatic cancer progression, sensitivity to chemotherapy, and metastasis. Science Translational Medicine 2017 Apr 5;9(384). doi: 10.1126/scitranslmed.aai8504.
[2]pancan.org/about-us/vision-of-progress/

RECOGNITION

In 2015, Dr Timpson was awarded the Len Ainsworth Fellowship in Pancreatic Cancer Research which provides significant financial support for his research. Dr Pajic holds the Philip Hemstritch Fellowship in Pancreatic Cancer Research, which was established in 2011 to assist Dr Pajic's work to improve outcomes for those affected by pancreatic cancer. The research was also supported by NHMRC, Cancer Australia, Cancer Council NSW, Cancer Institute NSW and Tour de Cure.

>> Pictured above Dr Paul Timpson (L) and Dr Marina Pajic (both of Garvan's Cancer Division), who led the new research into 'priming' pancreatic tumours before chemotherapy.

Author: Meredith Ross, Science Media & Communications Coordinator, Garvan Institute of Medical Research

Embedding research in the health system for the broader community

While most researchers have no difficulty citing the number of papers they've had published in academic journals, the influence that their research has had on policies or programs on the ground is often less obvious. And yet, this is often exactly what is needed to embed research in the health system or the broader community.

For Melbourne researcher Claire Wilkinson, the knowledge that her research is set to be used by health agencies in the real world has been one of the most satisfying aspects of contributing to a Sax Institute Evidence Check rapid review.

It is over a decade since the Institute launched the Evidence Check rapid review program, with the aim of providing concise, rapidly available summaries of published research evidence to answer specific policy questions.

There have now been more than 200 Evidence Checks commissioned by a wide range of agencies – and conducted by independent researchers -- on a vast array of topics ranging from social care to e-health and from drug and alcohol use to chronic disease management.

HOW THE EVIDENCE CHECK WORKS

When an agency commissions an Evidence Check, a Sax Institute knowledge broker works with them to establish the parameters of the review and to ensure the research questions will answer the agency's specific questions.

Ms Wilkinson, from La Trobe University, worked with colleagues on a review of the community impact of liquor licences that was commissioned by the NSW Ministry of Health's Centre for Population Health.

The review examined 191 studies published over the past decade, and found there was sufficient evidence to support restrictions on late trading hours for bars and hotels as a key approach to reducing late-night violence in Australia.

The Evidence Check report is now set to be used as part of a support module to give Local Health Districts guidance on responding to local liquor licence applications.

"To know that this is going to be used in such a practical way is very exciting," Ms Wilkinson said. "It's very easy for researchers be quite removed from what's happening in government to practice, but these reviews are tailored to policy needs and you can see how your research will be translated into the real world."

Head of the Institute's Knowledge Exchange Division, Ms Sian Rudge, said researchers could share their expertise by joining the Institute's Radar database – a national register of researchers in population health and health services research.

Researchers in the database are alerted to opportunities to work on Evidence Check reviews and other initiatives to help health decision makers access existing research, and to use it more effectively in their work.

> ***Evidence Checks give researchers the opportunity to work with policy and program agencies to support the use of research evidence in decision making," Ms Rudge***

IMPACT OF EVIDENCE CHECKS ON POLICY

A recently published review of 74 Sax Institute Evidence Checks that were commissioned by health policy agencies between 2006 and 2011 showed that in 77% of cases, policy makers reported they intended to use reviews to determine the details of a policy or program, while 16% intended to use the review to inform high-level planning or priority-setting processes.

Associate Professor Riyana Miranti, from the National Centre for Social and Economic Modelling (NATSEM) at the University of Canberra, recently led a team that conducted a yet-to-be-published Evidence Check on wellbeing indicators throughout the life stages.

She said the knowledge brokering process had been valuable in ensuring the research would answer the questions posed by the commissioning agency, NSW Family and Community Services (FACS). The review will be used by FACS in implementation of the NSW Human Services Outcomes Framework.

> ***While it is, of course, good to have research published in journals, we should see impact from various perspectives and this work can have an impact on policy," Professor Miranti said***

GET INVOLVED

- Join the Radar researcher database
- Browse the Sax Institute Evidence Check library

>> Pictured top right Associate Professor Riyana Miranti from the University of Canberra conducted led a team that conducted an Evidence Check on wellbeing indicators throughout the life stages.
>> Pictured left Researcher Claire Wilkinson from La Trobe University was co-author on an Evidence Check on the community impact of liquor licences that is being used to give guidance to Local Health Districts.

Submitted by: Megan Howe, Publications and Marketing Manager – Communications, Sax Institute

#researchfunding, #cysticfibrosis, #cure4cf #southaustraliaresearch

SIGNIFICANT FUNDING BOOST FOR

CYSTIC FIBROSIS AIRWAY RESEARCH

Adelaide has emerged strongly in the race to cure Cystic Fibrosis, thanks to a substantial grant from a private South Australian foundation

The $670,000 investment by the Fay Fuller Foundation to the Cure4CF Foundation means that critically important preclinical testing of a potential cure for cystic fibrosis airway disease can finally begin.

For Greg Oke, founder of Cure4CF Foundation, and whose son is living with CF, the funding from the Fay Fuller Foundation means so much more than just money.

"From our perspective, we are very touched that the Fay Fuller Foundation has prioritised the support of developing the cure for Cystic Fibrosis lung disease" said Mr Oke.

"As parents of a child with CF, we are very grateful for the support of individuals and organisations that may not have a direct link to CF, but still wish to support the efforts to develop the cure. In the case of the support from Fay Fuller Foundation, this will make a significant impact to the timeline to get to human clinical trials, and ultimately help thousands of families worldwide who every day are dealing with the devastating effects of CF on their children and loved ones."

DID YOU KNOW?

CF is the most common inherited disease causing premature death affecting the developed world. CF is both life impacting, being a multi-organ disease, affecting the lungs, gut, liver, pancreas and reproductive tissues – and life limiting. Even with recent medical advances, at present about half of those with CF will die from lung disease by their late 30s.

>> Pictured **(LtoR) Dr Martin Donnelley PhD, Deputy Team Leader and Associate Professor David Parsons, Team Leader, Cystic Fibrosis Airway Research Group.**

The two-year project being undertaken by the Cystic Fibrosis Airway Research Group at the Alan Scott CF Research Laboratory in Adelaide, is led by pioneering scientist Associate Professor David Parsons. This project in an integral step in their critical pathway to human clinical trials, and will test the ability of their unique gene therapy approach to potentially halt or reverse cystic fibrosis airway disease.

The project will establish and use the first Australian CF rat colony to test the effectiveness of corrective gene therapy on CF lung health. It will also use a revolutionary X-ray imaging technology, which can map airflow during breathing, to accurately measure changes in lung health.

> ***Medical research at this level can at times be painstakingly slow and of course very expensive," said Associate Professor Parsons***

"But after 20 years of steady success we know that we are on the right track. The funding provided by the Fay Fuller Foundation will allow us to demonstrate that this airway gene therapy, carefully developed in Adelaide, can prevent or halt the progression of CF in the lungs. In the global efforts to find a cure for cystic fibrosis, this research is a significant advancement."

THE SOCIAL IMPACT

Research undertaken by the team has already shown that their gene transfer approach is successful in several non-human models. However, like many research groups worldwide, they are constantly facing the challenge of sourcing funds and partners that are willing to take a risk on an investment in research during the period prior to clinical trials.

Fortunately, the Fay Fuller Foundation's most recent grant round which called for 'Discovery' projects, proved the perfect partnership.

"For a number of years we have been following the work of the CF Airway Research Group and their pioneering methods, and we saw their current funding needs as integral to driving their research forward," said David Minns, Chairman, Fay Fuller Foundation.

"To have such world class scientists developing a gene therapy intervention here in Australia is a wonderful story and one that we are keen to support."

Cure4CF Foundation Chairman, David Coluccio believes that this grant has come at a pivotal time for Cure4CF, and the research team they support. "This grant is a tremendous vote of confidence in the work that the Adelaide research team we support is conducting. Seventy thousand people are living with cystic fibrosis and the eyes of the medical world are on us."

"Adding a corrective CF gene into the affected airway cells of people with CF is recognized as the only way to potentially prevent or effectively treat the disease. What this ultimately could mean is that if a baby born with CF is given airway gene therapy at birth, the disease should never develop; and for people living with CF today, it has the potential to halt lung disease in its tracks.

WHAT NEXT?

If this project proves successful, it will be a global breakthrough in the treatment and assessment of an illness for which a cure has so far remained elusive. A cure that families worldwide are desperately waiting for.

On behalf of: Cure4CF Foundation

@CSL
#fellowship #hmrfunding

BIOMEDICAL RESEARCHERS

WANTED

The CSL Centenary Fellowships are offered to outstanding Australian researchers seeking to consolidate their career and undertake medical research at an Australian research institute

For more than 100 years, CSL has been at the forefront of Australian public health and some of the most important breakthroughs in medical research including the large-scale manufacture of penicillin and the development of a vaccine to protect against cervical cancer.

Last year, CSL commemorated the company's 100 year anniversary. It was an important milestone, not just for the organisation, but for the Australian science community more broadly. In honour of CSL's long legacy of contributing to Australian public health and medical research - particularly for patients with rare and serious diseases - we established a flagship $25 million fellowship program for discovery and translational research.

As well as paying tribute to CSL's origins by supporting Australia's scientific community the CSL Centenary Fellowships are intended to help foster world-class medical research excellence.

The fellowships offer high-value, long-term, competitively-selected grants to mid-career medical researchers seeking to consolidate their career and undertake medical research in an Australian academic institution.

In 2016, the inaugural fellowships were awarded to two outstanding Australian scientists; Professor Geoffrey Faulkner and Associate Professor Steven Lane. Both were conferred with a $1.25m, five year fellowship.

Professor Geoffrey Faulkner from the University of Queensland thinks long-term memory might be stored in our brain's DNA and he'll test his theory in brains affected by Alzheimer's.

It's a bold idea. Geoff has already shown that the DNA in our brains is different to that in the rest of our bodies, and that it changes as we learn. He's proposing that these changes are associated with how we store our long-term memories. With the CSL Centenary Fellowship he'll test the idea on brain tissue donated by Alzheimer's patients to determine if DNA is involved in memory formation, and what the implications of this might be for people living with Alzheimer's.

His research is moving us closer to an understanding of conditions like alzheimer's and hopefully towards a cure for this chronic and devastating disease.

Associate Professor Steven Lane from the QIMR Berghofer Medical Research Institute wants to tailor leukaemia treatments to reduce relapse rates in older patients.

Today, 85 per cent of children with leukaemia can be cured, but the outlook for patients over 60 is bleak, with only 10 per cent surviving beyond one year as their cancer adapts to weather the storm of standard chemotherapy treatments. Steven wants to change that outlook.

He has developed a method to rapidly profile the genetics of leukaemia types and model them in the lab, allowing him to map the effectiveness of chemotherapy treatments against the genomes of individual cancers.

The fellowship will support his efforts at tailoring treatments to individuals by identifying new drug pathways and exploring the use of existing drugs to target resistant leukaemia types.

Geoff and Steven are the embodiment of what the CSL Centenary Fellowships are about and we are extremely proud to support research that holds the potential to save and change many lives.

APPLY TODAY

Two five-year Fellowships are to be awarded each calendar year, for 10 years. The total value of each award is A$1.25 million.

Applications for 2018 Fellowships open on June 1, 2017. Visit: cslfellowships.com.au

>>Pictured: **CSL's Chairman, Prof. John Shine and CEO, Paul Perreault presented the inaugural CSL Centenary Fellows with their award at a ceremony in Melbourne in 2016.**
LtoR: Prof. John Shine AO, Prof. Steven Lane, Mr Paul Perreault, Prof Geoff Faulkner, Dr Andrew Cuthbertson AO.

Submitted by: CSL Limited

@scienceANU @CSIROnews
#Alzheimer #Parkinson
#CSIRO

FROM UHT MILK TO AGE-RELATED DISEASES

Understanding protein-protein interactions

In Australia, more than 400,000 people are living with dementia and over a million with type 2 diabetes. Researchers from CSIRO and the ANU are trying to understand the protein interactions and subsequent aggregation that occur in these and other related diseases by investigating similar interactions occurring in UHT milk when it forms a gel upon long-term storage.

Ultra-high temperature (UHT) treatment of milk involves the heating of milk at around 1400C for a few seconds. This process leads to sterilization and enables the long-term storage of milk without refrigeration. However, the dairy industry has long had problems with the shelf-life of UHT or long-life milk with it often becoming unstable and hence unusable after a few months of storage at room temperature due to the formation of a gel.

AGE-GELATION OF UHT MILK

The proteins in milk identified as being responsible for this so-called age-gelation of UHT milk are the two structurally unrelated proteins, *β-lactoglobulin* (a major whey protein) and *κ-casein* (a major casein protein). It is well known that these two proteins individually form protein clusters, known as *amyloid fibrils*, which have a structure very similar to the protein deposits found in the brains of Alzheimer's and Parkinson's disease patients. Furthermore, amyloid fibril formation of concentrated protein solutions is often accompanied by gel formation. Accordingly, Prof. John Carver, the Director of the Research School of Chemistry at the Australian National University, and Dr Jared Raynes, a research scientist at CSIRO, set out to investigate the interactions and possible amyloid fibril formation of *β-lactoglobulin* and *κ-casein*, not only to understand how to potentially improve the shelf-life of UHT milk, but also to understand protein-protein interactions and their subsequent aggregation in diseases such as Alzheimer's, Parkinson's and type 2 diabetes.

The high magnification of a powerful electron microscope reveals that protein clusters or fibrils, similar in morphology to those in the brains of Alzheimer's and Parkinson's disease sufferers, are present in aged, gelled UHT milk.

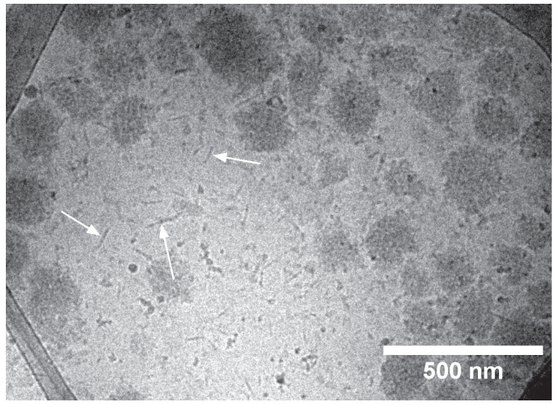
"Knowing that in the biochemical and biomedical research literature there are examples of two peptides or proteins interacting to form co-aggregated amyloid fibril protein clusters even though their primary amino acid sequences are different, we thought that this phenomenon might be occurring in age-gelation of UHT milk because β-lactoglobulin and κ-casein are co-localized in the aggregated protein structures of aged UHT milk," Dr Raynes said.

To test this hypothesis, Dr Raynes and Prof. Carver mimicked the UHT process in the laboratory using a system containing only these two proteins without the remaining milk components. What they found was that not only did *β-lactoglobulin* and *κ-casein* form *amyloid fibrils* individually under these UHT conditions, but when heated together, the two proteins co-aggregated into amyloid fibril clusters containing both proteins.

RESEARCH DISCOVERIES

"We were able to prove that *β-lactoglobulin* and *κ-casein* co-aggregate into protein fibril clusters by using a range of advanced analytical techniques including electron microscopy and single-molecule fluorescence microscopy. In a general context, these findings are important because they show that two structurally unrelated proteins can co-aggregate into amyloid fibril clusters, a phenomenon that is potentially important in the progression of some age-related, protein aggregation diseases. We must emphasise though that, whilst these protein clusters are found in aged UHT milk, UHT milk is safe for consumption as these protein clusters are broken down in our body (for example in our stomach) by our digestive enzymes," Dr Raynes explained.

In age-related diseases such as type 2 diabetes, sufferers are at greater risk of also developing Alzheimer's disease, which is proposed to be due to the interaction of the *peptide Amylin* (the putative pathological species in type 2 diabetes) and the *Amyloid-β peptide* (the putative pathological species in Alzheimer's disease). This conclusion was drawn from the observation that *Amylin fibril* clusters were co-localised with *Amyloid-β fibril* clusters in the brains of patients with both type 2 diabetes and Alzheimer's disease, implying that one of the peptides may facilitate the aggregation of the other peptide. Dr Raynes' and Prof Carver's findings from their investigation of the age-gelation of UHT milk add evidence that indeed two unrelated proteins can co-aggregate into *amyloid fibril* clusters.

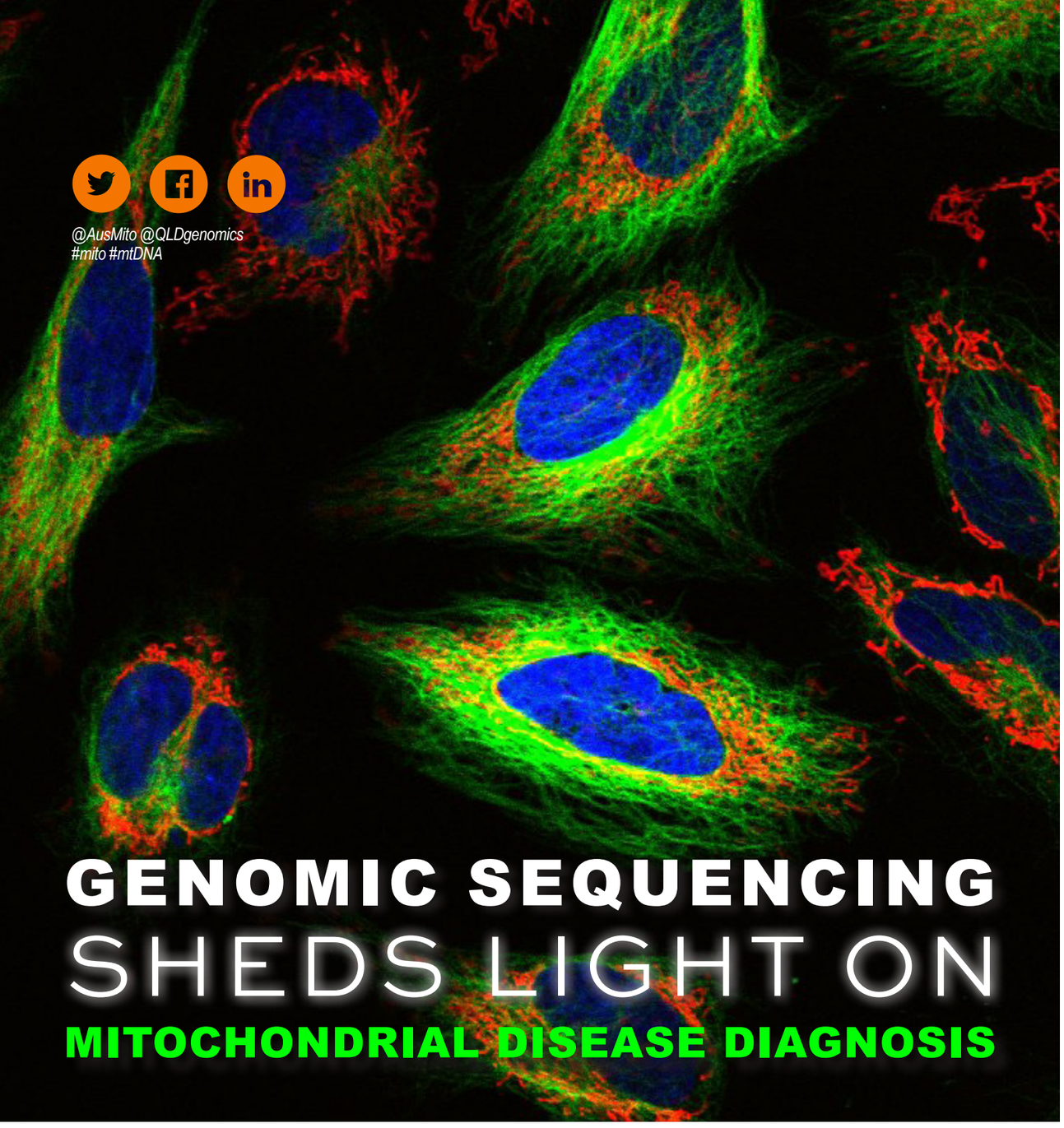


>>Pictured Dr Jared Raynes next to samples of aged, gelled UHT milk.
>>Pictured bottom left Cryo-electron micrograph image of aged, gelled UHT showing the presence of *amyloid fibril* protein clusters, as indicated by arrows.

> ***Not only does this research have important implications in understanding the mechanisms of age-gelation in UHT milk and protein aggregation diseases, but it may also provide novel means to use the desirable structural properties of these two co-aggregated amyloid fibril proteins to make novel bionanomaterials for a wide range of applications," said Dr Raynes.***

Author – Dr Jared Raynes, Research Scientist, Agriculture and Food, **CSIRO**

This research was first published in the journal Small



@AusMito @QLDgenomics
#mito #mtDNA

GENOMIC SEQUENCING SHEDS LIGHT ON MITOCHONDRIAL DISEASE DIAGNOSIS

A genetic diagnosis of mitochondrial disease can make the world of difference with inclusion in research trials, accumulating treatment and prevalence data and the emotional relief of understanding the basis for one's symptoms.

Due to its heterogeneous in presentation and severity, it makes it very difficult to make a clinical diagnosis. An estimated 1 in 200 Australians carry a mitochondrial DNA (mtDNA) genetic mutation that puts them at risk of developing mito in their lifetime. Because mitochondria are present in all cells but erythrocytes, mito can manifest in almost any organ system which often leads to misdiagnoses or long periods without a diagnosis.

Paediatric cases are often severe or fatal, appearing most commonly as neurodevelopmental syndromes such as Leigh disease. Conversely, the majority of adult cases are caused by mtDNA mutations. Because of the heteroplasmy of the mitochondrial genome and the mitotic segregation of mtDNA over time, mtDNA mutations generally manifest later in life with progressive onset, requiring lifetime surveillance and symptom management.

Clinicians do not always pursue a diagnosis of *mito*, possibly because there is no cure, treatment is limited and the prognosis is often severe or even fatal. Researchers however realise that the first step in developing a treatment or cure is better understanding the disease process, including discovering mito's biochemical pathogenesis and population prevalence. Diagnostic investigations are thus crucial.

DEFINITION

Mitochondria are the power houses of the cell providing the body with over 90% of the energy it needs to sustain life. Mitochondria take in sugars and proteins from the food we eat and produce energy called ATP that our bodies use to function properly. Mitochondrial disease (mito) is a debilitating and potentially fatal disease that reduces the ability of the mitochondria to produce this energy. When the mitochondria are not working properly, cells begin to die until eventually whole organ systems fail and the patient's life itself is compromised.

The current standard diagnostic pathway is estimated to diagnose only 10 to 15% of people with *mito*. Standard biochemical tests are often non-specific or invasive. First level investigations including metabolic panels or lactate/pyruvate ratios are not robust predictors of *mito*. Second level investigations, such as histological tissue assays, are procedurally complex and require anaesthetic agents which may be harmful to *mito* patients.

However, genetic techniques have now emerged as key diagnostic tool. Data demonstrates that whole exome or whole genome sequencing, enabled by high-throughput technology, is significantly faster, more accurate and increasingly, cheaper than standard tests for *mito*.

A genetic diagnosis allows researchers to more accurately estimate the prevalence of *mito* and build gene libraries to facilitate future diagnoses and therapies.

Genetic diagnosis is usually an inclusion criterion for clinical trials and is, therefore, crucial to expanding the evidence base for future research.

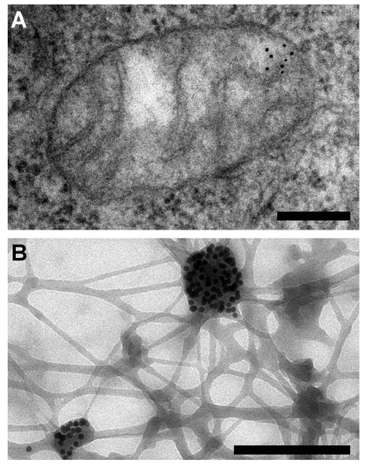
Such a diagnosis also allows affected individuals to make informed reproductive decisions. Families with known mtDNA mutations may choose to conceive by in vitro fertilisation with pre-implantation diagnosis. Australian families may soon have the option to undertake mitochondrial donation in the form of a maternal spindle transfer or pronuclear transfer, thereby ensuring only healthy genetic material is transferred from an affected mother's egg into a donor egg that has had its nuclear DNA removed.

An accurate diagnosis enables clinicians to manage symptoms and gather data about treatment efficacy. In general, mitochondrial disease patients benefit from lifestyle changes, including improved nutrition and physical therapy. Informed patients and clinicians can avoid compounds that are toxic to the mitochondria such as sodium valproate, certain antibiotics and anaesthetics agents. Many *mito* patients take vitamins and cofactors like CoQ-10 to support mitochondrial function. Leading *mito* clinicians worldwide have recently contributed their knowledge toward mitochondrial disease standards of care using DELPHI consensus technique.

HOW THIS RESEARCH IS MADE POSSIBLE

The Australian Mitochondrial Disease Foundation (AMDF), in partnership with the Australian Genomic Health Alliance (AGHA), is supporting a two-year study to evaluate the efficacy of whole genome and whole exome sequencing in the diagnosis of mito. A primary goal of this study is to ensure that all undiagnosed Australians under suspicion of mitochondrial disease will have access to a genetic diagnosis.

Genomic methods could increase mitochondrial disease diagnosis rates from an estimated 10-15% to nearly 80-85%, and are a truly revolutionary opportunity worth pursuing.



>>Pictured Electron microscopy reveals mitochondrial DNA in discrete foci
>>Pictured left page Multicolor fluorescence image of living HeLa cells

Submitted by: Australian Mitochondrial Disease Foundation (AMDF)

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#ResAusAwards

RESEARCH AUSTRALIA HEALTH & MEDICAL RESEARCH AWARDS 2017

Make a colourful splash into the Awards season this year by nominating that extraordinary person, team or organisation that has made a significant difference to health and medical research.

It's so easy to nominate:

1. Select the Award Category for your nominee
2. Read the Award Categories criteria
3. Submit your nomination on the online form

Submissions close Monday 17 July 2017

Still have questions?
Email awards@researchaustralia.org

Now in its 15th year, the Research Australia Health and Medical (HMR) Research Awards are stronger than ever. The talent and excellence in this sector continues to grow and is simply astounding. Research Australia considers the acknowledgment and celebration of the extraordinary work in health and medical research crucial to bringing the wider community along by using practical outcomes to demonstrate just how important HMR is to us all.

Nominations are now open for you to nominate a person, team or organisation for one of the Award Categories.

- Advocacy Award
- Data Innovation Award
- Great Australian Philanthropy Award
- Griffith University Discovery Award*
- Health Services Research Award
- Leadership in Corporate Giving Award
- The Peter Wills Medal

* In recognition of the Discovery Award winner, Griffith University will also offer the following prize:

- The opportunity to present a guest lecture at Griffith University
- Return economy flights from within Australia to the Gold Coast
- Two nights' accommodation.

WHY NOMINATE?

As the national peak body for health and medical research, Research Australia's HMR Awards are highly regarded and coveted in the health and medical research sector.

- The research profile of awardees is greatly increased within the sector
- Success drives other research opportunities for you and your collaborators
- Award-winning logo for your website, email signature and future submissions
- Winners and Highly Commended will be awarded at the Gala Night on Thursday 5 October in Melbourne and acknowledged in front of sector leaders including Universities, MRIs, Federal and State Government, your colleagues and friends
- Be listed amongst the alumni of research professionals, teams and organisations that have won Awards in the past

Nominations for the GSK Award for Research Excellence is also open. This Award will be presented alongside Research Australia HMR Award winners in Melbourne on Thursday 5 October.

Proudly supported by

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THE SEARCH FOR BREAST CANCER TREATMENT

Researchers from the Centre for Cancer Biology are urgently working on a new treatment option for triple negative breast cancer patients after discovering an association between a particular growth factor and blood vessels which help tumours to grow

Breast cancer remains one of the most common cancers in Australia for women with the National Breast Cancer Foundation stating that one in eight Australian women will be diagnosed with breast cancer in their lifetime while around 140 men will be diagnosed with breast cancer every year.

Around 3000 Australians die every year due to breast cancer - that's nine people per day.

And for 15-20 per cent of patients diagnosed with breast cancer, a lack of three specific hormone receptors on their tumour classes their cancer as triple negative breast cancer which means drug options to target those receptors (e.g. progesterone, estrogen and HER2) are not an option, leaving chemotherapy as the only real treatment option.

It is these 15-20 per cent of breast cancer patients whom researchers from the Centre for Cancer Biology (CCB) – an accredited Australian Medical Research Institute that is a partnership between the University of South Australia and SA Pathology – are desperately trying to help through a research project looking at the proteins responsible for tumour vascularisation.

COMBING THE EXPERTISE OF TWO LABORATORY HEADS

Associate Professor Claudine Bonder, Head of the Vascular Biology and Cell Trafficking Laboratory brings her vascular biology expertise to the project while Head of the Cytokine Receptor Laboratory (and Co-Director of the CCB), Professor Angel Lopez specialises in growth factors and in particular *interleukin-3.*

"We know from our work in previous projects, that the growth factor of *interleukin-3* can help normal blood vessels to grow and repair," explains Associate Professor Bonder who last year was awarded an Emerging Innovator Award at the South Australian Innovation Awards.

"And it's been well documented that cancer tumours only grow to approximately one millimetre cubed before they need new blood vessels to come in and help the cancer to grow.

"Because the best cure for cancer is to surgically remove it when it is small and hasn't spread, many approaches have been taken to try to block those blood vessels from entering into the tumours and prevent their growth and metastasis throughout the body.

"We have discovered that some breast cancer patients have higher levels of this growth factor – *interleukin-3* – and we are now investigating if there is an association with that and the blood vessels which help tumours grow.

"Our work so far supports our theory that if we block *interleukin-3*, we block these cancer cell-derived blood vessels as well as the normal endothelial cells from feeding the tumour.

"We are really excited that this work could ultimately result in a new treatment option for breast cancer patients, particularly for those triple negative breast cancer patients who have limited treatment options."

Associate Professor Bonder says it is this basic discovery and the potential of being able to contribute something significant like this to patients with cancer, which makes the work so fulfilling.

"We are all working tirelessly to feed into the greater knowledge that ultimately provides better outcomes for patients with cancer," Associate Professor Bonder says.

The breakthrough in the connection between the growth factor and blood vessels in breast cancer was made possible through the collaborative approach of the CCB.

"Because our labs are co-located and we share equipment and we share laboratory meetings and the ideas are floated for everyone to contribute; lateral thinking takes place and cross fertilisation of ideas happens over time," Professor Lopez says.

> ***That's the advantage of having concentrations of like-minded people in an integrated research and pathology environment, working in close proximity - everyone is together and there is free exchange of ideas."***

And for the breast cancer project, the benefits of combining research and pathology may be realised for breast cancer patients in the next 10-15 years.

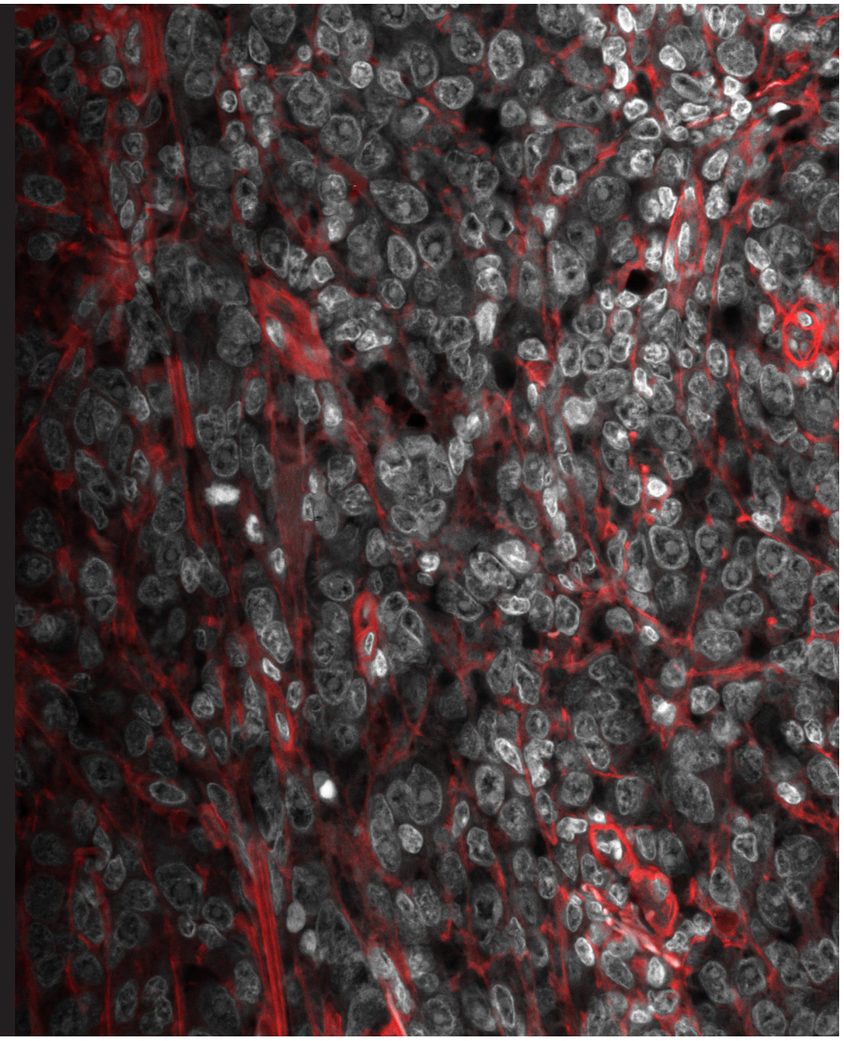
"Our vision is firmly focused on finding causes and cures for cancer while our mission is to conduct breakthrough research on the fundamental costs of cancer and translate these discoveries into cures with global impact," Professor Lopez says.

Author: Associate Professor Claudine Bonder (pictured above), Head: Vascular Biology and Cell Trafficking Laboratory, Centre for Cancer Biology, University of South Australia

>> **Image of Research photography competition 2016,** *When cancer masquerades as life,* **Dr Zahied Johan, Research Assistant, Centre for Cancer Biology.**

This image shows an extensive network of basement membrane (red) infiltrating between melanoma tumor cells. Basement membrane is typically found along blood vessels. In solid tumors however, the vast network of this structure may indicate the ability of tumor cells to line up and form microvascular channels, a process called vasculogenic mimicry. This ingenious process allows tumor cells to channel nutrients from the main blood vessels, so that they can proliferate aggressively and survive at distant sites. Using cell lines and knocking down techniques, our laboratory is currently studying a protein regulating this event. By knocking down this protein, we hope vasculogenic mimicry can be blocked, thus reducing melanoma aggression.

@unisaresearch @UniversitySA @claudine_bonder



RESEARCHERS AND THE HEALTH DATA MAZE

Tracing the the myriad of difficulties facing Australian researchers in their attempts to access data

The Capital Markets CRC and Research Australia have teamed up to write the next instalment of the well-received *Flying Blind* series, *Volume Two: Researchers and the Health Data Maze.*

Australian researchers are known internationally for their innovative, world-class contributions to health and medical research. They've come up with breakthroughs such as developing cochlear implants and helping develop penicillin.

Australian health and medical research (HMR) is hampered by a great range of barriers which exist at all levels of the research landscape, and in particular, those which curtail access to data. The result? Australian HMR is slowed, drastically.

Where Volume One focused on the problems stemming from the acute fragmentation of consumer health data in an Australian context, ***Volume Two: Researchers and the Health Data Maze*** seeks to cast light on the range of obstacles and impediments that currently frustrate the efforts of Australian researchers trying to access the HMR data that are so vital to their work.

To support this effort, the HMQ team has decided to take a slightly different approach during the writing of Volume Two: by posting a weekly blog. This blog is being written as the research effort progresses with a view to providing researchers and other interested readers a forum in which to comment on, debate and critique the work to date. All constructive comments are appreciated, and the team is particularly excited at the prospect of receiving feedback regarding new ideas and avenues to be included in the work – and on top of that, suggestions aimed at helping inform the recommendations which will conclude the report.

The blog was launched on May 17 by Research Australia CEO Nadia Levin (pictured right) at the Capital Markets CRC's annual Health Market Quality Conference, *Emerging Trends in Digital Health.*

ARE YOU INTERESTED IN CONTRIBUTING A GUEST POST?

If you'd like to write a post concerning an current Australian HMR issue which is important to you, your team or your organisaiton, please get in touch at research@cmcrc.com.

Take a read and join in the discussion at: flyingblind.cmcrc.com/researchers-health-data

>> Pictured above **Nadia Levin| Research Australia CEO, Capital Markets CRC's annual Health Market Quality Conference, *Emerging Trends in Digital Health***

Both the report and the blog will examine exactly why Australian researchers spend such an extraordinary amount of time and energy identifying data sources, negotiating with multiple data custodians and data linkage units, applying to multiple ethics committees and obtaining consent from individuals, providers and other stakeholders in their attempts to access data – as well as each of the difficulties and barriers that arise when they attempt to link this data. Doing so requires a comprehensive review of the entire Australian HMR data environment, something which means looking at:

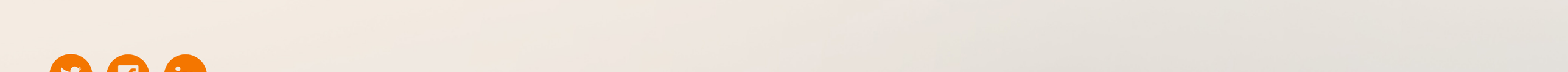
- HMR data repositories in Australia – such as Cancer Registries, Rehab Registries and 45 and Up Data – and their use by the research community
- Policies regarding the conditions of research data access and use
- Current approaches to data ownership and custodianship
- Ethics committee processes
- Regulations around HMR data access, linking and storage
- And finally, policies around data reuse for research purposes

Following from this, the blog and report will discuss some examples of best practise research infrastructure and data governance policies overseas, before concluding with a series of recommendations centering on how Australia can design a world-leading HMR research environment: one which can enable access to research data in a manner which is both secure and efficient, and in doing so, streamline research processes and protocols, increase the transparency of research datasets and maximise the longevity and re-use of linked datasets whilst preserving privacy and confidentiality. In turn, the team hopes that this framework will help maximise Australian research capacity and productivity – all so that Australians can continue to benefit from the high-quality HMR research that Australian researchers are known to deliver.

Author: Michael Nolan, Research Analyst, Capital Markets CRC

@orygen_aus
#lambertinitiative #mentalhealth
#depression #anxiety

NOVEL TREATMENTS IN MOOD AND ANXIETY DISORDERS



Mental ill health is by far the major threat to the lives and futures of young Australians. In particular, depression and anxiety impact on the lives of hundreds of thousands of young people in Australia every year

These forms of mental ill health typically emerge during the transition from childhood to adolescence and early high school and can persist, even in young people who have had happy or uneventful childhoods. Of course, stressful, traumatic childhoods with broken attachments create much higher levels of risk. One thing is for sure; no young person is immune!

It is becoming increasingly clear that anxiety is a very common experience for young people. This is not merely a matter of "normal" stress but more severe distress which can restrict social functioning even to the point of dropping out of school and avoiding friends and social contact. Anxiety in many young people is the gateway to other syndromes notably depression, self-harm and substance abuse. Intervening early is an obvious preventive priority.

Anxiety disorders are the most prevalent psychiatric conditions in children and adolescents affecting around 15% of young people in Australia.

They severely disrupt the developmental trajectories of affected children and adolescents. Prospective longitudinal data consistently show that the course of early anxiety manifestations is often chronic predicting the continuation of the same condition in adulthood, as well as increasing the risk of developing additional secondary psychopathology such as mood or substance use disorders later in life. Besides leading to adult psychiatric morbidity, early anxiety disorders have a negative impact on long-term functioning and general physical health.

Since anxiety disorders in children and adolescents are often the outset of a "cascade of psychopathology", optimal treatment during the early course of anxiety disorders is crucial to improving outcomes. Efficacious treatments for anxiety disorders include CBT and selective serotonin-reuptake inhibitors/selective serotonin–norepinephrine reuptake inhibitors (SSRIs/SSNRIs). However, approximately 40-50% of youth with anxiety disorders do not respond to CBT or SSRIs/SSNRIs as mono-therapy.

So at Orygen, the National Centre of Excellence in Youth Mental Health, our research teams are studying novel treatment strategies in mood and anxiety disorders to help those who still struggle to recover. These exciting new therapies include using virtual reality to "turbo charge" current psychological approaches, the use of novel biotherapies such as aspirin, anti-inflammatory agents, and omega 3 fatty acids to target new biosignatures, and social approaches to ensure that vocational and employment pathways are safeguarded.

LATEST RESEARCH ON THE USE OF MEDICINAL CANNABIS

One of our newest projects, supported by the Lambert initiative at the University of Sydney, will explore the use of medicinal cannabis as a novel biotherapy. Cannabis sativa and its extracts have been used for medicinal purposes across many cultures for thousands of years. Our focus is on one element of cannabis, *cannabidiol* or CBD, a promising non-intoxicating component extracted from the cannabis plant.

Preclinical and human research suggests CBD to be a promising treatment agent for anxiety disorders, with excellent tolerability and safety. Anxiolytic, anti-inflammatory and neuroprotective properties of CBD are consistently shown across animal and human studies alongside emerging evidence for CBD as an effective therapeutic for psychosis, depression and anxiety disorders. CBD has minimal clinically relevant side effects and this high margin of safety coupled to an emerging therapeutic profile supports the current investigation of its efficacy as novel intervention for young people with treatment-resistant anxiety.

Anxiety is a part of the human condition but when it becomes intense and persistent, it becomes a threat to health and well-being. Orygen is determined to develop much better strategies of intervening early and effectively with this common mental health problem and helping young people to realize their full potential.

Author: Professor Patrick McGorry AO , Executive Director, Orygen

ULTRASOUND AND DRUG RESEARCH

@QldBrainInst #UQ #alzheimer

>> Pictured *Blood Brain Barrier*
Adekunle Bademosi / Queensland Brain Institute at The University of Queensland

University of Queensland researchers are a step closer to non-invasive treatment of Alzheimer's disease, with the discovery that ultrasound enhances the effectiveness of immunotherapy in reducing toxic protein build-up.

The research, from UQ's Queensland Brain Institute (QBI), could eventually make expensive treatments of Alzheimer's much more cost-effective.

"This discovery is another promising step towards future therapeutic treatments for dementia," says QBI Director, Professor Pankaj Sah.

"Excitingly, by extension, the research shows that ultrasound may also be a viable treatment for other disorders in which proteins aggregate in the brain – including Parkinson's and motor neurone disease."

Alzheimer's disease is the most common form of dementia and affects more than 290,000 Australians.

It is characterised by a brain build-up of proteins called *beta-amyloid* and *tau*, which are thought to destroy brain cells and cause symptoms such as memory loss and confusion.

Director of QBI's Clem Jones Centre for Ageing Dementia Research (CJCADR) Professor Jürgen Götz and his colleagues previously established in 2015 that ultrasound could be used to reverse Alzheimer's symptoms and restore memory in amyloid plaque–forming mice.

This breakthrough discovery holds potential for treating Alzheimer's disease without using drug therapeutics.

The ultrasound innovation transiently opens the blood–brain barrier, activating microglial cells that digest and remove the plaques that build-up in Alzheimer's.

THE NEW RESEARCH

Led by Professor Götz and Dr Rebecca Nisbet showed that ultrasound alone also reduced toxic *tau* protein clumps, but combining ultrasound with an antibody treatment was more effective than either treatment alone in removing protein clumps and reducing Alzheimer's symptoms in mice with a tau pathology.

One line of research into Alzheimer's treatment is the use of immunotherapy – delivering antibodies into the brain to target and destroy the toxic proteins deposits.

One of the hurdles is that antibodies and other drugs need to first cross the blood–brain barrier, which by design is there to keep out foreign substances from the brain.

The blood–brain barrier keeps the bloodstream largely separate from the fluid surrounding brain cells, and prevents toxic compounds, bacteria and viruses from entering the brain.

"With vaccination trials in dementia currently ongoing elsewhere, the problem is that only an estimated 0.1% of the therapeutic antibodies enter the brain, which would make a potential treatment for Alzheimer's very costly," says Professor Götz.

The QBI team found that ultrasound temporarily opens the blood-brain barrier, which increases the uptake of drugs or antibodies. This would reduce the number of expensive treatments needed to restore memory function, as more antibody would be taken up by the brain, allowing for lower dosing.

The paper's lead author, QBI researcher Dr Rebecca Nisbet, says antibody therapies could cost an estimated $25,000 to $100,000 per patient per year, and their research could drastically reduce the cost of these treatments.

NEXT STAGE OF THE RESEARCH

Professor Götz says, it is to translate the initial findings in mice into a therapy for patients in coming years. "For that, we are doing safety trials in sheep, because we need to be sure that we can deliver sufficient energy to the brain through a thick skull in a safe way. We are running experiments in ultrasound test beds, and we also need to understand the blood-brain barrier better," he says.

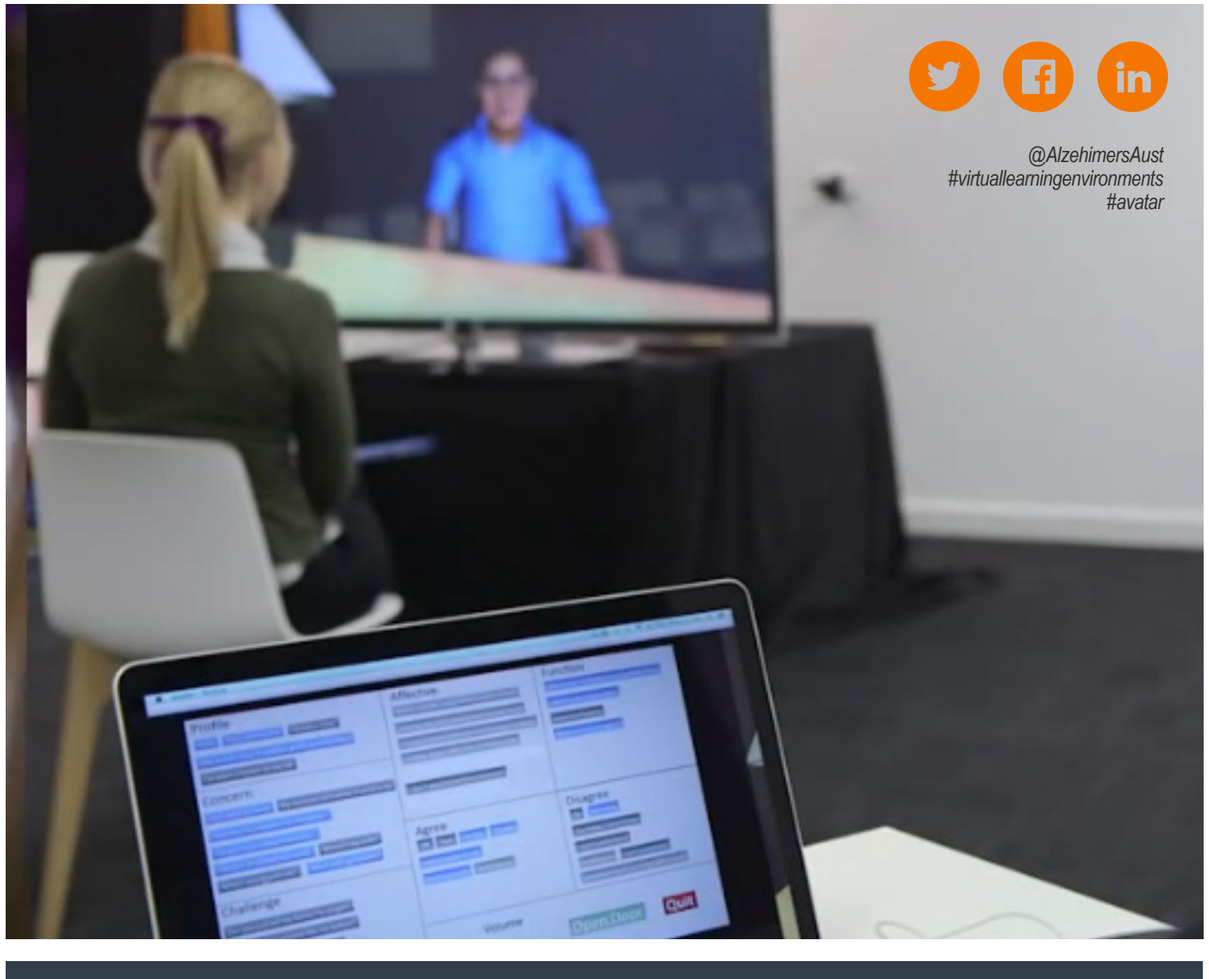
The number of dementia cases in Australia is expected to rise to more than 1 million after 2050. It is the second leading cause of death in Australia.

Professor Götz says he is driven by the need to find a solution to the staggering numbers of people with dementia. "Every day, I receive many emails from patients and relatives of those affected…hearing someone's life story—about somebody who was so capable and who achieved so much in life and then suddenly found everything deteriorating—is very sad. Knowing that time is pressing for patients and families pushes us to work hard."

SUPPORTED BY

The research was made possible through the support of the Queensland Department of Science, Information Technology and Innovation, the Federal government, and philanthropic support led by the Clem Jones Foundation.

Submitted by: Queensland Brain Institute at The University of Queensland



@AlzehimersAust
#virtuallearningenvironments
#avatar

AVATAR HELPS TO TRANSFORM DEMENTIA CARE TRAINING

An avatar called Jim is redefining the way health professionals are trained to communicate with people living with dementia, bringing research into the aged care environment

For the more than 400,000 people estimated to be living with dementia in Australia, communication difficulties represent one of the most prominent, intimate and distressing symptoms.

Because of this, communication and empathy skills are crucial for community health professionals and family members when interacting with and caring for people with dementia.

Making meaningful communication training available for carers and family members is increasingly difficult. Classroom-based theoretical training methods are often ineffective, whilst clinical placement opportunities are limited and expensive to deliver.

ADVANCES IN TECHNOLOGY PROMOTE NEW RESEARCH

New virtual learning environments (VLEs), designed by a team of researchers from the School of Psychology and Speech Pathology at Curtin University, are helping to fill the gaps. These virtual environments offer realistic, cost-effective, evidence-based training solutions where health and aged care trainees can develop and practice communication facilitation techniques in a safe and confidential environment.

The Empathy Simulator is an Alzheimer's Australia Dementia Research Foundation funded virtual solution currently being delivered to carers and family members to develop empathy and communication skills. The two realistic avatars developed for this digital platform are Jim, an older Australian farmer with mild dementia and his wife Moira.

The Empathy Simulator was created by Dr Janet Beilby in partnership with a technology and design team from Citrine Technologies in Atlanta, Georgia with an advanced state of the art virtual reality development software platform.

The software is operated on a standard laptop computer and is HDMI-connected to a secondary large screen for viewing the virtual patient in life-size. The virtual patient's verbal and non-verbal responses are then operated by the trainer behind a one-way mirror in an observation room via laptop.

LIFE OF AN AVATAR

'Interacting with Jim, seeing his distress in response to his communication challenges, loss of independence and concern about his family, certainly reminds us of the person within and how important empathy and basic connection are.

'We believe that the avatars Jim and his wife Moira can be used to help health professionals and dementia care workers to really understand the importance of empathic communication and to develop their use of enabling more person-centred communication techniques."

> ***Some of the aged care workers who have interacted with Jim actively reached out to the screen to touch and comfort Jim, which shows that a real connection was formed.***

"The participants valued practicing sensitive and effective responses to Jim and welcomed the opportunity to reflect on their own communication style and to receive personalised feedback on their communication style – something none of the participants had received before."

The effectiveness of the VLE in developing interpersonal communication skills will continue to be evaluated in a research project beginning next month involving Home and Community Care (HCC) workers in Victoria. The study will compare the use of the VLE to an equivalent training program.

"We would love to see this sort of training becoming available, even mandatory, for all dementia care workers and we welcome any opportunity to talk with organisations interested in accessing this technology.

"Innovation projects like this have exciting prospects because such technologies can make training more standardised, feasible and cost-effective across a broad range of care settings. The training might be virtual but the learning is very real.

"The next developments for Jim will include artificial intelligence, voice recognition software and having Jim placed in a virtual hospital bed to help students learn how to prepare for and conduct bedside assessments. We see endless opportunities for the application and use of Jim to transform practice," Dr Beilby said.

SUPPORTED BY

The Empathy Simulator **was supported by an Alzheimer's Australia Dementia Research Foundation – Victoria Project Award. It represents the work of a team from Curtin University including Dr Janet Beilby (Project Leader), Dr Jade Cartwright (Co-investigator and Project Manager) and Ms Ann-Marie Haygarth (Research Assistant), Dr Shelley Brundage (George Washington University – Co-investigator), Dr Josh Spitalnick (Citrine Technologies CEO/President VLE Design and Research Partner).**

Author: Dr Janet Beilby, Associate Professor, Curtin University

@Bupa @NHMRC
#Researchfunding #healthsystem

FUTURE PROOFING THE HEALTH SYSTEM

The NHMRC Partnership Centre for Health System Sustainability is a new and unique research entity

The purpose of the Centre is to explore the issues affecting the sustainability of the health system and develop and evaluate a set of implementable interventions that are appropriate from a clinical, patient and economic perspective. Commencing this year, the outcomes of the work will be practical in nature and relevant to governments at all levels.

A collaboration of 17 lead investigators, 20 expert advisors and over 40 system implementation partners from around the country are joining forces to tackle interventions that will significantly improve the sustainability of Australia's health system.

The Centre is jointly governed and funded to the value of $10.75 million over five years by the NHMRC, Bupa Health Foundation, NSW Health and the University of Notre Dame Australia and led by Professor Jeffrey Braithwaite, Foundation Director of the Australian Institute of Health Innovation at Macquarie University in Sydney.

Professor Braithwaite said that tackling health system sustainability is a pressing concern of many developed countries and requires a multi-dimensional, collaborative approach.

"Sustainability implies that the health system endures and adapts by ensuring limited resources (physical, financial and human) are used efficiently and responsibly enough to continually maintain or improve population and individual health and wellbeing in a constantly changing external environment," he said.

"It must deliver on the triple bottom line; simultaneous financial, social and environmental return on investment. It includes adapting how we deliver services, health promotion, more prevention, corporate social responsibility and developing more resilient and enduring models of care that are accessible to all patients who will benefit from them.

"This requires sensitivity to local settings where care is delivered. We need to be inclusive of stakeholders right across the country, and be rigorous in our research if behaviour and policy change are to occur, and the system is to endure." Professor Braithwaite said.

An Inaugural Symposium was held in Sydney on 16 March 2017 to showcase the proposed research to be conducted, and to stimulate critical discussion and involvement in formulating the vision and future work of the Centre.

Annette Schmiede, Research Australia's Board of Directors, Bupa Health Foundation Executive Leader and Chair of the Centre's Governance Authority said feedback was both constructive and positive. "This Partnership Centre is a great example of how academics, practitioners and researchers are joining forces with industry partners to try and develop new ways to improve the sustainability of our health system," said Ms Schmiede.

Research Area 1:
Using Analytics, Technology and Shared Data to improve health and system performance.

The proposed activities in Research Area 1 recognise that innovation in the design and use of information and communication technologies has an important role in detecting clinical variation, as well as in informing the decisions made by clinicians and patients to improve service delivery and outcomes.

Research Area 2:
Reducing Waste and Low-value Care

The overall goal of Research Area 2 is to develop a clear and actionable understanding of the two major components of waste in Australia – overtreatment/overuse and sub-optimal care delivery or coordination – and to enable the development of appropriate interventions to target the highest priority areas.

Research Area 3:
Promoting Better Value for the Health Dollar

The aim of Research Area 3 is to improve the provision of value-based health care through the generation and use of new knowledge about economic incentives in funding models, priority-setting and decision-making within the healthcare system, and the role and effects of competition.

The vision of the Centre is that the research findings will significantly influence the evolution of a resilient health care system that is affordable, cost-effective and delivers improved health outcomes for all Australians over time.

>> Pictured below Back row standing L to R: Professor Jonathan Karnon, Dr Liam Caffery, Professor Robyn Ward, Professor Paul Glasziou, Ms Joanna Holt, Professor Len Gray Middle Row Standing L to R: Professor Enrico Coiera, Professor Rachelle Buchbinder, Professor Anthony Scott, Ms Leanne Wells, Dr Trent Yeend Sitting L to R: Professor Johanna Westbrook, Ms Annette Schmiede, Professor Jeffrey Braithwaite, Professor Christine Bennett, Dr Teresa Anderson

Submitted by: Bupa Health Foundation

The Sohn Australia - Hearts & Minds Investment Leaders Conference held in November, 2016, featured distinguished global and local investment professionals who shared their expertise, experiences and exclusive investment ideas. The event provided a unique opportunity to both raise money and drive awareness of the need for strong investment in medical research in Australia. The Conference was successful in fundraising more than $3 million.

The four charities selected to take part in the highly-acclaimed event included Research Australia members:

- Victor Chang Cardiac Research Institute
- The Black Dog Institute
- MS Research Australia
- JDRF

These charities were chosen based on their high-impact research and expertise in their respective fields of heart disease, depression, multiple sclerosis and type 1 diabetes. With a high percentage of the profits going directly towards medical research, it was important to the event organisers that they involve charities with the ability to make a real and tangible difference with the funding.

"The event was a huge success and it was incredibly encouraging to see the level of support from the business community. It's a strong sign that they recognise the need for transformational investment in medical research.

"I think the best idea of the day was the day itself! In the highly competitive not-for-profit space we need to be much more innovative in the way we fundraise and garner support for scientific research. This event highlights a new approach to fundraising and I believe this is the way forward," Professor Graham said.

Not only did the event organisers succeed in creating awareness but also managed to ensure that the vast majority of all funds raised from sponsorship and ticket sales went directly towards medical research. They managed this by garnering funding and pro bono assistance from iconic Australian companies, resulting in an impressively low fundraising cost ratio.

The Hearts and Minds Investment Leaders event was the brainchild of well-known activist investor, Company Director of The Centre for Independent Studies and Board member of the Victor Chang Cardiac Research Institute, Dr Gary Weiss. He was inspired by similar events overseas such as the Sohn and the Robin Hood Investors Conference, that both started in New York.

> ***It's terrific when funds are raised for research, particularly in an area that you are passionate about. It's quite something, especially when an innovative forum such as this raises funds for four great medical research causes- all of which desperately need a lot more light shone on them." said Dr Matthew Miles, CEO, MS Research Australia***

From the perspective of those involved in the medical research community a conference like this aimed at encouraging people to "invest" in the future of medical research in Australia is extremely encouraging. With an increased investment in research, greater momentum will be made, fast tracking medical breakthroughs that could lead to finding a cure, improving treatment and preventing disease.

> ***This conference brought together the best minds in the investment community in a manner that also generated substantial funding for medical research. It is a powerful, innovative model that should be celebrated for the impact it has delivered," Mike Wilson, CEO and Managing Director, JDRF Australia***

>> Pictured (L to R) Mr Mike Wilson JDRF, Prof Bob Graham Victor Chang Institute, Professor Helen Christensen Black Dog Institute, Dr Matthew Miles MS Research Australia

This will now become a signature annual event. The 2017 Sohn Australia- Hearts and Minds Investment leaders Conference takes place on November 17 and it looks set to be even bigger and better.

> ***Medical research is recognised by all of us as the single best way to make Australians healthier. We thank Sohn Australia – Hearts and Minds – for the leadership they have shown in recognising this, and in making it so easy for corporate Australia to contribute. Without medical research and evidence-base practice – we won't progress,"***

Author: Petricia Augustus, Head of Communications, Marketing and Operations, MS Research Australia

#fightstroke, #clincialtrials, #healthservices

GETTING THE MESSAGE ACROSS

Early accurate post-stroke language diagnosis setting patients on the path to recovery

Imagine what it would be like not to be able to communicate. Ordering a coffee, reading a newspaper, speaking, reading and writing are such everyday activities that living without them seems impossible. However, for stroke patients who experience damage to the language centers of their brain, this is a reality.

NEW RESEARCH IS HELPING STROKE SURVIVORS GET THEIR LANGUAGE BACK.

A world-first, innovative new acute language test has been developed by Australian researches to accurately and reliably diagnose stroke language impairments. It has been designed to help Australia's 470,000 stroke survivors live their best lives after stroke.

THE IMPACT OF LANGUAGE IMPAIRMENT

One-in-three stroke survivors will have difficulties with speech and language. Language disorders are debilitating, not only limiting a person's functional ability to communicate, but also affecting an individual's role in the community, relationships and even their identity.

Increasingly, evidence is indicating that language therapy initiated early in the acute stroke phase optimises patient outcomes. Accurate diagnosis of acute stroke language conditions is the first step to ensuring the right patients receive rehabilitation treatment at the right time.

The Brisbane Evidence-Based Language Test (Brisbane EBLT) is a cutting edge new test, the first known diagnostically-validated acute speech pathology language test of its kind in the world. The new assessment was developed by researchers at The University of Queensland with the support of the Stroke Foundation, RBWH Hospital and Hospital Foundation and ANZ/Equity Trustees.

THE COMPLEXITY OF LANGUAGE

Principal project researcher at The University of Queensland Alexia Rohde said language was multifaceted and impairments varied in their clinical presentation.

Rohde said for language assessment to be effective, it not only has to be valid and reliable, but must include evaluation of skills across the different language modalities.

"Without comprehensive assessment, areas of deficit may be missed," Rohde said.

> ***Tests must assess not only a patient's ability to express themselves, but how well they comprehend language.***

"They must determine if patients can understand what is said to them, or comprehend the meaning behind a gesture or action – such as a wave – or read a written instruction – such as a medicine label.

"This new test not only had to accurately and reliably diagnose acute language impairments, but also gauge patient abilities and communicative strengths and weaknesses by assessing language across all modalities of language functioning.

"Only when a thorough understanding of a patient's communicative abilities is determined can early post-stroke language therapy be initiated," she said.

Rohde said after thorough assessment, strategies can be implemented to help the patient's everyday communication on the hospital ward.

"These may be as simple as using a pen and paper to write, talking using short, simple sentences or the use of a picture communication board," she said.

AN EVIDENCE-BASED APPROACH

The next challenge for the research team was to ensure the test was tailored for use in the acute hospital ward context.

Immediately after stroke, patient abilities fluctuate and often tolerate only short therapy sessions. Swift patient discharges mean speech pathologists have to conduct thorough assessments in only a short window of time. Brisbane EBLT development was therefore guided by the four principles of evidence-based practice (EBP):

- **Clinician experience;**
- **Patient values;**
- **Clinical context; and**
- **Psychometric validation through clinically-relevant research trials.**

>>Pictured above Brisbane EBLT test forms and stimulus items. The test uses everyday objects easily found on a hospital ward – two cups, spoons, knives and pens.

Over 100 speech pathologists provided feedback on developed test items and patient feedback was also sought throughout the test's development. The test underwent significant piloting in the acute hospital environment to ensure it was appropriate for use in this context. In the final development phase, the Brisbane EBLT underwent psychometric analysis examining the test's reliability and ability to accurately diagnose acute language impairment.

The new test, the Brisbane EBLT, has been made available as a free resource to speech pathologists globally. Health professionals can register, access and download the Brisbane EBLT from the website brisbanetest.org.

Since the website's launch in December 2016, speech pathologists from 15 countries have accessed this new assessment; including Australia, New Zealand, the United Kingdom and the United States of America, and non-English speaking countries such as Chile, Turkey and Oman.

Future research will look at the impact of this test on improving acute post-stroke language recovery and the potential of translating the test into other languages.

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